

## WHAT IS CLAIMED IS:

1. A polymeric composition to be used in producing foam, the composition being characterized by Dynamic Mechanical Spectroscopy using a frequency of 1.00 radians/sec and 25 mm diameter parallel plates with a 1.00 mm gap to have a complex viscosity ( $\eta^*$ ) in the range of  $1.6 \times 10^4$  to  $6.0 \times 10^4$  poise and loss tangent  
5 ( $\tan \delta$ ) in the range of 0.7 to 1.4 at 190°C, and a power-law relation between  $\tan \delta$  and  $\eta^*$  where the exponent is within the range between -0.35 and -0.01 for the temperature range of 190° to 230°C, and comprising:

conventional linear polypropylene in the amount of from about 1 to 25 weight percent of the polymeric composition, the conventional linear polypropylene similarly  
10 characterized by Dynamic Mechanical Spectroscopy to have  $\eta^*$  in the range of  $1.0 \times 10^4$  to  $1.5 \times 10^5$  poise and  $\tan \delta$  in the range of 0.8 to 3.5 at 190°C,

high melt strength polypropylene in the amount of from about 51 to about 85 weight percent of the polymeric composition, the high melt strength polypropylene similarly characterized by Dynamic Mechanical Spectroscopy to have  $\eta^*$  in the range  
15 of  $2.1 \times 10^4$  to  $2.5 \times 10^4$  poise and  $\tan \delta$ , in the range of 0.9 to 1.2 at 190°C and a power-law relationship between  $\tan \delta$  and  $\eta^*$  where the exponent is in the range of -0.33 and -0.30; and

a rheology modifier resin in the amount of from 5 to about 30 weight percent of the polymeric composition.

20

2. The composition of Claim 1, wherein the conventional linear polypropylene is from about 10 to about 20 weight percent.

3. The composition of Claim 1, wherein the high melt strength polypropylene is from about 55 to about 65 weight percent.
4. The composition of Claim 1, wherein the rheology modifier resin is from  
5 about 10 to about 20 weight percent.
5. The composition of Claim 1, wherein the conventional linear polypropylene is from about 10 to about 20 weight percent, the high melt strength polypropylene is from about 55 to about 70 weight percent and the rheology modifier resin is from  
10 about 10 to about 20 weight percent.
6. The composition of Claim 1, wherein the blend is characterized by a loss tangent ( $\tan \delta$ ) in the range of 0.8 to 1.2 and complex viscosity ( $\eta^*$ ) in the range of  $1.6 \times 10^4$  to  $4.7 \times 10^4$  poise at 190°C, and a power-law relationship between  $\tan \delta$  and  
15  $\eta^*$  where the exponent is in the range of -0.33 and -0.15 for the temperature range of 190°C to 230°C.
7. The composition of Claim 1, wherein the conventional linear polypropylene is selected from the group consisting of post-industrial recycled polypropylene, post-  
20 consumer recycled polypropylene, offgrade virgin polypropylene, and blends thereof.
8. The composition of Claim 7, wherein the conventional linear polypropylene is characterized by a loss tangent ( $\tan \delta$ ) in the range of 0.8 to 1.8 and complex viscosity ( $\eta^*$ ) in the range of  $3.9 \times 10^4$  to  $4.8 \times 10^4$  poise at 190°C.

9. The composition of Claim 1, wherein the rheology modifier resin is selected from the group consisting of hydrogenated styrene-isoprene-styrene block copolymer (SEPS), styrene-butadiene random copolymer, hydrogenated styrene-butadiene random copolymer, styrene-isoprene random copolymer, hydrogenated styrene-isoprene random copolymer, styrene-butadiene block copolymer (SBR), hydrogenated styrene-butadiene block copolymer (SEB, SEBC), styrene-butadiene-styrene block copolymer (SBS), hydrogenated styrene-butadiene-styrene block copolymer (SEBS), styrene-isoprene block copolymer (SIR), hydrogenated styrene-isoprene block copolymer (SEP), styrene-isoprene-styrene block copolymer (SIS), styrene-ethylene copolymer, styrene-propylene copolymer, ethylene-styrene graft copolymer, propylene-styrene graft copolymer, EPM-styrene graft copolymer, EPDM-styrene graft copolymer, and combinations thereof.

10. The composition of Claim 9, wherein the rheology modifier resin is a hydrogenated styrene-isoprene-styrene block copolymer (SEPS) or hydrogenated styrene-butadiene block copolymer (SEB, SEBC), styrene-butadiene-styrene block copolymer (SBS).

11. The composition of Claim 10, wherein the rheology modifier resin is a hydrogenated styrene-isoprene-styrene block copolymer (SEPS) or hydrogenated styrene-butadiene block copolymer (SEB, SEBC).

12. A process for preparing a polymeric foam, the process comprising:

- (a) melting a conventional linear polypropylene, a high melt strength polypropylene and a rheology modifier resin to form a polymeric composition, the polymeric composition comprising from about 1 to 25 weight percent of conventional linear polypropylene, from about 51 to about 85 weight percent of high melt strength polypropylene and from about 5 to about 30 weight percent of the rheology modifier resin, the composition being Dynamic Mechanical Spectroscopy using a frequency of 1.00 radians/sec and 25 mm diameter parallel plates with a 1.00 mm gap to have complex viscosity ( $\eta^*$ ) in the range of  $1.6 \times 10^4$  to  $6.0 \times 10^4$  poise,  $\tan \delta$  in the range of 0.7 to 1.8, and a power-law relation between  $\tan \delta$  and  $\eta^*$  where the exponent is within the range between -0.35 and -0.01
- (b) adding a stability control agent to the polymeric composition;
- (c) dissolving an effective amount of blowing agent;
- (d) transferring the mixture of step (c) to an expansion zone; and
- (e) permitting the mixture of step (d) to expand in the expansion zone to produce the polymeric foam.

13. The process of Claim 12, further including the step of adding a nucleating agent before step (d).

14. The process of Claim 13, wherein the nucleating agent is selected from the group consisting of talc, crystalline silica, and a mixture of citric acid and sodium bicarbonate.

15. The process of Claim 14, wherein the nucleating agent is talc.

16. The process of Claim 12, wherein the blowing agent is chosen from the group consisting of methane, ethane, propane, n-butane, isobutane, n-pentane, and blends thereof.

5 17. The process of Claim 16, wherein the blowing agent is chosen from the group of n-butane, isobutane and a blend thereof.

18. The process of Claim 11, wherein the stability control agent is chosen from the group of stearamide, erucamide, and a blend thereof.

10

19. A polymeric foam formed by the process of Claim 11.

20. The process of Claim 11, wherein the conventional linear polypropylene is from about 10 to about 15 weight percent.

15

21. The process of Claim 11, wherein the high melt strength polypropylene is from about 55 to about 65 weight percent.

22. The process of Claim 11, wherein the rheology modifier resin is from about 10  
20 to about 20 weight percent.

23. The process of Claim 11, wherein the conventional linear polypropylene is from about 10 to about 15 weight percent, the high melt strength polypropylene is from about 55 to about 65 weight percent and the rheology modifier resin is from  
25 about 10 to about 20 weight percent.

24. The process of Claim 21, wherein the conventional linear polypropylene is selected from the group consisting of post-industrial recycled polypropylene, post-consumer recycled polypropylene, offgrade virgin polypropylene, and blends thereof

5 25. The process of Claim 11, wherein the rheology modifier resin is selected from the group consisting of hydrogenated styrene-isoprene-styrene block copolymer (SEPS), styrene-butadiene random copolymer, hydrogenated styrene-butadiene random copolymer, styrene-isoprene random copolymer, hydrogenated styrene-isoprene random copolymer, styrene-butadiene block copolymer (SBR), hydrogenated  
10 styrene-butadiene block copolymer (SEB, SEBC), styrene-butadiene-styrene block copolymer (SBS), hydrogenated styrene-butadiene-styrene block copolymer (SEBS), styrene-isoprene block copolymer (SIR), hydrogenated styrene-isoprene block copolymer (SEP), styrene-isoprene-styrene block copolymer (SIS), styrene-ethylene copolymer, styrene-propylene copolymer, ethylene-styrene graft copolymer,  
15 propylene-styrene graft copolymer, EPM-styrene graft copolymer, EPDM-styrene graft copolymer, and combinations thereof.

26. The process of Claim 25, wherein the rheology modifier resin is a hydrogenated styrene-isoprene-styrene block copolymer (SEPS)

20

27. The process of Claim 11, further including the step of adding at least one additive before step (d).

28. The process of Claim 27, wherein at least one additive is selected from the group consisting of antistatics, coloring agents, fire retardants, anti-microbial agents, anti-mold agents, antioxidants, and plasticizers.

5 29. A polymeric foam prepared by the process comprising:

(a) melting a conventional linear polypropylene, an high melt strength polypropylene and a rheology modifier resin to form a polymeric composition, the polymeric composition comprising from about 1 to 25 weight percent of conventional linear polypropylene, from about 55 to about 85 weight percent of high melt strength  
10 polypropylene and from about 5 to about 30 weight percent of the rheology modifier resin, the conventional linear polypropylene having a complex viscosity in the range of  $1.0 \times 10^4$  to  $1.5 \times 10^5$  poise and  $\tan \delta$ , in the range of 0.8 to 3.5 at 190 °C and a frequency of 1.00 radians/sec and the rheology modifier resin is a member of the group of styrene-olefin copolymers.

15 (b) optionally adding a stability control agent to the polymeric composition;

(c) dissolving an effective amount of blowing agent;

(d) transferring the mixture of step (c) to an expansion zone; and

(e) permitting the mixture of step (d) to expand in the expansion zone to  
20 produce the polymeric foam.

30. The polymeric foam of Claim 29, wherein the density of the polymeric foam is from about  $10 \text{ kg/m}^3$  to about  $160 \text{ kg/m}^3$ .

31. The polymeric foam of Claim 29, wherein the cross-section of the polymeric structure is less than about 15 mm.

32. The polymeric foam of Claim 29, wherein the polymeric structure is dimensionally stable.

33. The polymeric foam of Claim 29, wherein the conventional linear polypropylene is from about 10 to about 20 weight percent.

34. The polymeric foam of Claim 29, wherein the conventional linear polypropylene is selected from the group consisting of post-industrial recycled polypropylene, post-consumer recycled polypropylene, offgrade virgin polypropylene and blends thereof and the rheology modifier resin is a member of the group of styrene-olefin copolymers.

35. The polymeric foam of Claim 34, wherein the rheology modifier resin is a hydrogenated styrene-isoprene-styrene block copolymer (SEPS) or hydrogenated styrene-butadiene block copolymer (SEB, SEBC), styrene-butadiene-styrene block copolymer (SBS)

36. The polymeric foam of Claim 35, wherein the foam is suitable for applications of food packaging; transportation components such as automotive trunk liners; construction materials such as pipe wrap and flooring underlayment; sports and leisure equipment such as bodyboards, life vests, seat cushions, and floatation devices; and protective packaging of delicate and fragile high surface quality goods.